SCIENCE

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BOTANY IN JAMAICA.

BY JAMES ELLIS HUMPHREYS.

We are apt to think, when speaking of American botany and botanists, only of those of the United States and Canada, assuming that our southern neighbors, both continental and insular, have not yet reached that stage of civilization that encourages the cultivation of the sciences. And so far as those regions are concerned which have felt the influence chiefly of Latin civilization, this is measurably true. But some of the neighboring islands have been under Anglo-Saxon rule for two centuries or more, and have felt different influences. Not, indeed, that their people, as a class, have been much affected by contact with their rulers, but in the British islands the mother country has especially fostered botanical study from an early time, and British residents have carried with them the scientific impulse.

Jamaica has been a British colony for fully two hundred years, and it is now more than one hundred since its first botanic garden was established at Bath. At first privately supported, it afterward received spasmodic government support. But eventually the site was abandoned and a new location was chosen beside the Wag water and among the beautiful hills of the interior nineteen miles north of Kingston. From this time the support of the government was constant and effective, and the Castleton garden grew steadily in consequence, under competent directors sent out from England. It has now an especially notable collection of palms and orchids, besides its economic collection.

Meantime the Hope Gardens, near Gordon Town, and six miles from Kingston, begun for private pleasure when the island was in the full tide of its prosperity from the profits of sugar and rum, have been taken up by the government and are destined to be the chief botanical centre of the island. This collection is newer than that at Castleton and therefore does not possess as many fine specimens and, in some other respects, does not equal it. But most of the propagating and active work of the department is now done at the Hope Gardens. As must inevitably be the case with most government establishments, the chief work of the Botanical department of Jamaica, as of other British colonies, is economic, the study of the useful plants of the colony, their propagation and products. Its work is at present ably directed by Mr. William Fawcett, F. L. S., formerly of the British Museum.

A third establishment in charge of the department is the experimental *Cinchona* plantation far up the Blue Mountains. Here, also, is the official residence of the Director, in an almost ideal location and climate. Indeed, it is said, to quite justify the enthusiasm of an admirer, who called it "the loveliest spot in the British empire."

This place, called Cinchona, can be reached only by a narrow bridle-path that runs twelve miles upward into the heart of the mountains from Gordon Town.

The department issues a periodical bulletin of the results of its work.

Ever since the time of Patrick Bowne and Sir Hans Sloane, the higher plants of the island have found devoted students. And among them must be specially mentioned Grisebach, whose "Flora of the British West Indies," London, 1863, remains the only hand-book of the subject. But the Thallophytes of the region have received little attention and offer a very attractive field.

The wife of the present energetic governor of the island, Sir Henry Blake, some time since proposed the raising of a fund to establish a permanent marine biological laboratory as a memorial to Columbus, who landed on the island on his second voyage. The idea is an admirable one, but the project remains, so far as can be learned, *in statu quo*. A small and well-equipped laboratory at a suitable point on the island, open to the zoölogists and botanists of the world, might be of the greatest service in affording means for the collection and preservation of the numberless tropical forms of life in which Jamaica and the surrounding waters abound. A party of zoölogists from the Johns Hopkins University has this year, for the second time, established a temporary laboratory at Port Henderson on Kingston harbor; but I understand that this choice of a location has been largely governed by the presence of suitable accommodations. It will be agreed that, in determining the site for a permanent laboratory, the abundance of available vegetable, as well as animal, life should be consulted. After a somewhat careful examination of the marine flora of the easterly part of the island, as far west as St. Ann's Bay, the writer can say that several of the ports on the north side are far more favorable, botanically, than Kingston harbor. And perhaps no region is, on the whole, more favorably situated or richer in its vegetation than the neighborhood of Port Antonio. This port has more frequent communication with the United States than even Kingston, from its extensive fruit trade. And the journey from Europe to Jamaica is less monotonous and less expensive, as well as quite as quick, *via* the United States, as by the Royal Mail from England.

Another factor of considerable importance lies in the much cooler and more healthful climate of the north side of the island, as compared with the south side.

In Jamaica, then, the botanist finds evidences of past and present activity in certain lines, and the sympathy and aid of fellow workers. It is much to be hoped that he may soon be able to find, also, the laboratory facilities, which will enable him to study to the best advantage the unsolved problems of tropical vegetation.

INTRODUCTION OF WEEDS IN GRASS SEED.

BY THOMAS A. WILLIAMS, STATE AGR'L COLLEGE, BROOKINGS, S. D.

In the course of some experiments on forage plants, which were begun last season on the Station grounds, quite a large quantity of grass and clover seed was purchased from various seedsmen, principally from Hendersons, of New York. At the time of sowing some of the packages were found to contain more or less seed of various weedy plants. The plots were watched closely, and the following plants were found to have been introduced:

Cruciferae.—Nasturtium palustre, (L.) D. C.; Sisymbrium officinale, (L.) Scop; Camelina sativa, (L.) Crantz; Brassica arvensis (L.) B. S. P.; Brassica alba, (L.) Gray; Brassica nigra, (L.)Koch; Brassica campestris, L.; Erysimum cheiranthoides,L.; Erysimum orientale (?) L.; Diplotaxis tenui-

folia (?) (L.) D. C.; Raphanus raphanistrum, L.; Raphanus sativus, L.

Capparideae.—Cleome integrifolia, Torr. and Gray.

Violarieae.—Viola tricolor, L.

Caryophylleae.—Saponaria officinalis, L.; Saponaria vaccaria, L.; Silene antirrhina, L.; Silene noctiflora, L.; Lychnis alba, Mill; Agrostemma githago, L.; Cerastium arvense, L.; Stellaria media, (L.) Smith; Spergula arvensis, L.

Geraniaceae.—Geranium pusillum, L.; Erodium cicutarium, (L.) L'Her.

Leguminosae.—Vicia sativa, (L.) Koch.

Umbilliferae.—Carum carui, L.; Coriandriem sativum, L.; Daucus carota, L.

Rubiaceae.—Galium sp. ?; Galium tricorne, With.; Galium verum, L.

Compositae.—Anthernis cotula, L.; Achillea millefolium, L.; Carduus nutans, L.; Centaurea cyanus, L,; Taraxacum officinale, Web.; Sonchus arvensis, L.; Sonchus asper, Vill; Sonchus olenaceus, L.

Borragineae.—Lithospermum arvense, L.

Plantagineae.—Plantago lanceolata, L.

Polygonaceae.—Rumex crispus, L.; Rumex acetosella, L.; Rumex acetosa, L.

Gramineae.—Panicum crus galli, L.; Panicum glabrum, (Schrad,) Gaud; Panicum sanguinale, L.; Avena fatua, L.; Eragrostis, major, Host; Eragrostis pilosa, (L.) Beauv; Bromus mollis, L.

It is interesting to note the spread of weeds in a new State. *Saponaria vaccaria* is found along the railroads, together with *Anthemis cotula,* over the whole of eastern South Dakota. The former has even followed up the freighting trails over the range between Pierre and the Black Hills, where it is quite common, particularly at watering and camping places. Man is evidently the one who is responsible for the distribution of this weed.

PERIODICAL CICADA.

BY C. V. RILEY, UNITED STATES DEPARTMENT OF AGRICULTURE, DIVISION OF ENTOMOLOGY, WASHINGTON, D. C.

DURING the present year two broods of the Periodical Cicada, or so-called "Seventeen-year Locust" (*Cicada septendecim* L.), one of the seventeen-year (*septendecim*) race, and one of the thirteen-year (*tredecim*) race, will make their appearance in different parts of the country.

The following list of localities has been prepared from previous records. Any evidence giving the extent of territory over which they appear in any county or state, or any well-attested dates of their appearance in previous years, will be thankfully received and appreciated.

BROOD XVI.—Tredecim—(1880, 1893.) Alabama—Lowndes County. Georgia—Cobb and Cherokee Counties. Tennessee—Lincoln County. North Carolina—Lincoln and Moore Counties. This brood is but little known, and all localities require further confirmation this year.

BROOD XI.—Septendecim—(1876, 1893). North Carolina—From Raleigh, Wake County, to the northern line of the State; also in the counties of Rowan, Davie, Cabarrus and Iredell. Virginia—From Petersburg, Dinwiddie County, to the northern line of the State; Bedford and Rockbridge Counties; Valley of Virginia, from the Potomac River to the Tennessee and North Carolina lines. District of Columbia—Woods north of Washington. Maryland—Southern half of St. Mary's County. Kentucky—Trimble County. Indiana—Knox, Sullivan and Posey Counties. Illinois—Madison County. Kansas—Dickinson and Leavenworth Counties. Colorado—Cheyenne Canyon. This is a well-established brood, most of the localities in the Eastern States, as well as those in Indiana and Illinois, having been verified in past years; but the localities in Kentucky and Kansas require confirmation, and that in Colorado is extremely doubtful.

NOTES AND NEWS.

IN this age of rapid advancement in all lines of knowledge, especially in science, people have learned that combined organized labor accomplishes far more exact results than individual effort. Every department of science has its organization for the promotion of that science. Such an organization is the Wilson Ornithological chapter of the Agassiz Association, for the promotion of American ornithology. It is composed of active, associate and honorary members. It is in no respect a rival of the American Ornithologists' Union, but has its work conducted on a coöperative plan, and therefore necessarily largely systematic. While furnishing the more advanced with ample material for work, it also offers such opportunities to the younger and less experienced as are best suited to their needs. It seeks to educate those just beginning and those pursuing a dilatory course into the highest usefulness as working ornithologists. Active members pay an initiation fee and a yearly assessment of $1.00, and are limited to 100 in number. This number is now nearly reached. Associate members pay a yearly assessment of 50 cents and are unlimited in number. All working ornithologists are invited to join and aid in the work. Applications for membership should reach the President or Secretary before Sept. 20, to insure insertion in the list of candidates for the October election. Address either Willard N. Clute, Sec., Binghampton, N. Y., or Lynds Jones, Oberlin, Ohio.

—William Beverley Harison published on the 15th "The Foreigner's Manual of English." This is prepared for use in mixed classes of foreigners, and can be used without any knowledge of the several languages, as English only is used throughout. It has been carefully corrected to embody all of the suggestions of Gouin, whose book appeared after completion of first MS., and during revision the MS. has been successfully used in teaching Chinese, Polish Jews and others absolutely ignorant of both written or spoken English. The lessons are arranged to give in each a concrete subject, and a useful vocabulary is given to enable the student to talk from the beginning.

—The Chain Hardy & Company, Denver, Colo., have just ready the revised and enlarged edition of the "Geology of Colorado and Western Ore Deposits." This work of Professor Lakes, of the State School of Mines, has already run through one edition as applied to Colorado. Now that the Western States have been included the sale is expected to be quite extended. The plates illustrating the geological formations are very elaborate, and illustrate the peculiarities of veins and ore deposits. The book is designed for a text-book, and is also adapted for general reading by those interested in mining.

—Rand, McNally & Co. have in preparation the Proceedings of the Bankers' and Financiers' Congress held in Chicago from June 19 to 24.

—The Scientific Publishing Co. have just ready a work on "Universal Bimetallism and an international monetary clearing house, together with a record of the world's money statistics of gold and silver," etc., by Richard P. Rothwell, editor of the *Engineering and Mining Journal.*

—Macmillan & Co. have just ready "A Treatise on the Theory of Functions," by Prof. James Harkness, of Bryn Mawr College.

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Attention is called to the "Wants" column. It is invaluable to those who use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

THE ATMOSPHERE OF STELLAR SPACE.

BY G. D. LIVEING, CAMBRIDGE, ENGLAND.

IT was an interesting speculation that Sir R. Ball opened up in this journal, a short time since, with regard to the lunar atmosphere. His argument might easily be carried further, and would take us, as I shall try to show, into the realms of stellar space. It has been objected to his theory that the velocity of the particles of air at ordinary temperatures, though on the average about five hundred yards per second, is not enough to carry a particle so quickly away from the moon that it would not be drawn back again by its gravitation. This objection vanishes if we consider, not the average velocity, but the velocities of individual particles, and the changes those velocities rapidly undergo in consequence of frequent collisions among the particles. It is not easy to grasp the numbers involved in my argument, but I will state them on the authority of Lord Kelvin's popular lecture on the size of atoms. He gives the number of particles in one cubic centimetre, or one-sixteenth of a cubic inch, of atmospheric air at ordinary barometric pressure and at ordinary temperature, as not less than a million million of millions, or 10^{18}. Maxwell, in his article on "Atoms," in the Encyclopædia Britannica, makes the number greater. These particles cannot move far, not more on the average than about one hundredth of a thousandth of a centimetre, without encountering one another, so that each particle collides with one or another of its neighbors no less than five thousand million times in every second. If we suppose the density of the moon's atmosphere to be only a millionth of that of our atmosphere at the earth's surface, there will still be at least a million millions of particles in one cubic centimetre of it, and the frequency of their encounters with each other will still be some thousands per second for each of them. These encounters will cause them to be perpetually changing their velocities, and while some will have, at any given instant, velocities many times greater than the average, others will move at correspondingly slower rates. The directions, also, of their movements will be constantly changing from the same cause. If we suppose two particles, moving with equal velocities in directions at right angles to one another, to come into direct collision, one of them will have its velocity increased in the ratio of the square root of two to one, or rather more than seven to five, while the other will be reduced to momentary rest. If, now, the former come into a similar collision with a third particle, one of these two will acquire a still greater velocity. And considering the prodigious number of the particles and the short distance they can move without encountering others, it is evident that there must be an immense variety of rates of motion amongst them, and many of them must have velocities far exceeding that necessary to carry them clear away from the moon, or the earth, or even from the sun. In fact, amongst so many millions of millions the chance that some one will go on increasing its velocity at every one of a large number of successive encounters is very great indeed, practically a certainty. If this be granted, some, if it be but a small fraction of the whole, will be always escaping from the outer surface of the lunar atmosphere into the planetary space; and the like must go on from the atmospheres of other planets, only the fraction of the whole which get clear away from the bigger planets will be so much less because of the greater attraction of the bigger masses.

One interesting consequence of this escape of only the quicker moving particles, is that the temperature of interplanetary space must be thereby raised above that of the outer regions of a planet's atmosphere. For the temperature is directly proportional to the average square of the velocities of the particles, and as only the quickest fly off for good, the average velocity of the remainder must be less than that of those that break away. The process of dissipating an atmosphere into space might be stopped by its own cooling effect. But it is obvious that there is another cause which prevents anything like this. The planets are continually sweeping through the interplanetary space where the escaped particles are moving about, and even if the density of this interplanetary atmosphere be only a millionth of a millionth of the density of that at the earth's surface, still there will be at least a million particles in each cubic centimetre, and some of them will get swept up by the planets in their course and will not get away again. Hence the process of dissipation will cease when a planet picks up in its course through space just as many as it loses by diffusion in the same time. It follows from this that there must exist in planetary space an atmosphere, greatly reduced in density, it is true, but of the same chemical constitution as the earth's atmosphere. That is to say, the chemical constituents will be the same, though not quite in the same proportions. For the average velocity of the particles of nitrogen is a trifle greater than that of the particles of oxygen, and so the former will escape into space rather more frequently in proportion to their numbers than the latter. Besides, the effect of gravity is to increase very slightly the proportion of oxygen to nitrogen in the lower strata of the atmosphere. Hence, for both reasons, the atmosphere of planetary space will be a trifle richer in nitrogen than the air we breathe. There is so very little free hydrogen in our atmosphere that we cannot detect it, but for all that, it is most probable that there is a very little. And as oxygen particles are sixteen times as heavy as those of hydrogen, the proportion of free hydrogen to the other gases will be proportionally greater in the upper regions of the air than in the lower; and since hydrogen particles move four times as quickly as oxygen particles, it follows that the former will escape from the earth's attraction about four times as fast, and so the proportion of hydrogen in planetary space may be sensibly greater than in air we are able to test. A similar argument will apply to particles of water vapor, which are little more than half as massive as particles of oxygen. If all the planets are thus losing continually some of their atmospheres and picking up an equal amount from the space they move in, it follows that all the planets must have atmospheres of similar constitution to our own. For each planet has for ages been losing some of its own and acquiring some of the air

of other planets, and if there had ever been any difference, which is unlikely, considering the general unity of the solar system, it must long ago have disappeared in consequence of this interchange.

The argument is strengthened by what we know of the atmospheres of the planets, especially of our nearest neighbors, Mars and Venus. Not only do these planets give plain indications of their atmospheres, but it is certain that they are very much like our own. That is found out in the following way: Amongst the many dark lines, Fraunhofer lines, as they are called, in the solar spectrum there are certain well marked groups which Sir D. Brewster long ago pointed out to be due to the absorption of rays by our atmosphere, because they are seen to be blacker and more intense when the sun is low than when he is high in the sky. That is because the rays have to pass through a greater thickness of air before they reach us when the sun is nearer the horizon. Now, by carefully observing the light reflected from Venus and Mars, which must have twice passed through so much of their atmospheres as lies above the reflecting surface, it has been found that precisely the same rays which are darker when the sun is low are also darker in the spectra of these planets. Moreover, in these planets there are no new dark lines indicating any absorbent of a different kind. The more distant planets show additional absorption bands, but their atmospheres must, on account of their greater masses, perhaps also from lower temperature, be denser, and besides they appear to be full of clouds which may not be merely water-dust, and may well produce their own absorptive effects.

The argument, however, reaches a good deal farther. Not only are the planets moving through the so-called planetary space, but the sun and all its train are moving through the interstellar space. Astronomers are agreed that we are moving, but the direction of the movement is much better known than the pace. The rate is sometimes set down at about thirty miles a second: certainly not an extravagant estimate. But at any rate we are going, and leaving the interplanetary atmosphere, or some of it, behind. Even if the solar system had no such motion, the process of diffusion must gradually carry the interplanetary atmosphere into regions beyond, and, unless this diffusion were compensated by accession of air from without, the planets must gradually lose their atmospheres until the loss was stopped by the cooling effect before mentioned. After countless ages we have manifestly not reached that stage, so we must conclude that interstellar space is pervaded by an atmosphere, though it be of very great tenuity.

If this atmosphere is not of similar chemical constitution to our own, ours must be changing by slow degrees, and in course of ages the change must tell. There is, however, no reason to think that our atmosphere has for millions of years undergone any change sufficient to affect the constitution of animal life of the higher types, and if that be so the air of stellar space must be much the same as that of interplanetary space and our own. Sterry Hunt, from the preponderance of vegetable growth at certain periods of the earth's history, inferred that at those periods there must have been an excessive quantity of carbonic acid in the atmosphere; and he fancied that this was acquired from the stellar space as the solar system made its way into regions where there was an unusual amount of carbonic acid. Spectrum analysis has not led us to think that the chemical elements of the stars of any region are different from those with which we are acquainted in the earth and in the sun. Stars in the same region are mostly of the same type, and the types are few, and all the common types of spectra of stars give indications of elements which we know, and no certainty of any other elements. Distance makes no difference at all. The few stars with unusual spectra do not so much seem to have peculiar elements as to be in peculiar physical states. The universe seems, so far, of one make, and there are no facts which negative the supposition that the whole vast space through which we see stars is filled with air; air very rare indeed, perhaps not a millionth of a millionth as dense as ours, but still, on the whole, similarly constituted.

FISH ACCLIMATIZATION ON THE PACIFIC COAST.

BY HUGH M. SMITH, M. D., UNITED STATES FISH COMMISSION.

FEW experiments in fish culture have been economically more important and successful than those which have been conducted by the United States Fish Commission with reference to the Pacific Coast. Coincident with the propagation of native fishes the introduction of non-indigenous species has been undertaken, with results that have been extremely gratifying to fish culturists, and perhaps more striking than any previously obtained in this or any other country.

Among the fishes inhabiting the rivers and coast waters of the Atlantic slope, none is better known, more important, and more highly esteemed than the shad (*Clupea sapidissima*) and the striped bass or rockfish (*Roccus lineatus*), the former being a food fish, pure and simple, the latter combining a gamey disposition with excellent food qualities. These fish are anadromous, entering the fresh water for the purpose of spawning and passing a large part of the year at sea or in the salt water. Attention will be called to the experimental introduction of these fishes to the west coast, although several other important food-fish, among them the black bass (*Micropterus salmoides*) and catfish (*Ameiurus nebulosus*) might also be mentioned in this connection.

The introduction of shad fry to the west coast was first undertaken as long ago as 1871, when 12,000 young fish were deposited in the Sacramento River, under the auspices of the California Fish Commission. After that the experiment was taken up by the U. S. Fish Commission and carried on until 1886, during which time 609,000 young shad were placed in the Sacramento River, 600,000 in the Willamette River, 300,000 in the Columbia River and 10,000 in the Snake River.

Two or three years after the first fish were planted a few more or less mature examples were obtained in the Sacramento River; as additional deposits were made, the number of marketable fish began to increase, and the fish gradually distributed themselves along the entire coast of the United States north of Monterey Bay, until finally they have come to rank next to salmon in abundance among the river fishes of the west coast.

The U. S. Commissioner of Fish and Fisheries, in his annual report for 1887, speaking of the small plants of shad fry made in the Sacramento River at Tehama, says:

"From these slender colonies, aggregating less than one per cent of the number now annually planted in our Atlantic slope rivers, the shad have multiplied and distributed themselves along 2,000 miles of coast from the Golden Gate of California to Vancouver Island in British Columbia. They are abundant in some of the rivers, common in most of them, and occasional ones may be found everywhere in the estuaries and bays of this long coast line.

"Prior to our experiments on the west coast it was a dictum of fish culture that fish planted in a river would return to it when mature for the purpose of spawning. The result of these experiments has been to demonstrate

that this instinct of nativity, should it really exist, is in this case dominated by other influences, which have dispersed the shad planted in the Sacramento widely beyond the limits which we had assigned to them, and in the most unexpected direction.

"The cause is probably to be sought in the genial influences of the Japan current, which brings the warmth of equatorial Asia to temper the extremes of Arctic climate on the southern shore of the Alaskan Peninsula, and thence sweeping to the south, carries tropical heats to the latitude of San Francisco. Repelled on the one hand by the low temperature of the great rivers and fringe of coast waters, and solicited on the other by the equable and higher temperature of the Japan current, the shad have become true nomads, and have broken the bounds of the hydrographic area to which we had supposed they would be restricted. Following the track of the Asiatic current, and finding more congenial temperatures as they progress, it is not unreasonable to expect that some colonies will eventually reach the coast of Asia and establish themselves in its great rivers."

Shad are now found in greatest numbers in the Sacramento and Columbia Rivers, where they are of considerable economic value. Owing to the fact that very little apparatus specially adapted to their capture is employed, no correct idea of their actual abundance in a given stream can be formed. Nearly all the shad thus far taken have been obtained in nets operated for salmon or other fish, shad being only an incidental element in the catch. The price received by the fishermen is a good criterion of the abundance of the fish. When first taken, shad brought as much as $1.20 a pound; in 1892 the value in many places was only two cents a pound, and in the Columbia River at one period the catch was so large and the price so low that the fishermen did not go to the trouble of marketing the fish caught. The average price on the coast has declined in the past four years from ten cents per pound in 1889 to four cents in 1892.

An inquiry conducted by the U. S. Fish Commission in 1892 placed that bureau in possession of information showing the extent of the shad fishery in every river of the Pacific States. It was ascertained that in the year named 660,000 pounds of shad were marketed, the value of the same to the fishermen being about $27,000. Reports received during the present year indicate a catch of perhaps a million pounds, and it seems reasonable to anticipate a steady increase in the production with the improved facilities for shipment and the growing demand for fresh fish in the rising towns adjacent to the coast rivers. A careful estimate places the total value of the shad catch on the Pacific coast to date at $145,000, representing over 3,000,000 pounds, while the aggregate outlay for all purposes connected with the introduction of the fry was less than $4,000. This is certainly a satisfactory investment of the people's money.

The absence of a special scientific inquiry precludes the possibility of chronicling the changes which have probably been wrought in the habits of the shad as a result of the changed physical surroundings, thermic conditions, enemies and food supply. It may be noted, however, that the characteristic habit on the east coast of periodically ascending the rivers for the purpose of spawning and of returning, after the completion of that process, to the open sea where the principal part of the life of the fish is spent, appears to be considerably modified, in California, at least, where, in certain bays and estuaries, the shad is found in greater or less abundance during every month in the year. The evidence at hand indicates a condition prevailing in the littoral and fluvial waters of the Pacific coast that is very favorable to the growth of the shad. It is not unusual to take examples considerably larger than any ever seen in the eastern rivers. The average weight of the shad caught on the Atlantic coast is under four pounds, and the capture of fish weighing seven, eight or nine pounds is extremely rare. In California, however, it is not uncommon to secure shad weighing eight or ten pounds and reports have been made that fifteen-pound individuals have occasionally been obtained in salmon nets.

Of scarcely less consequence than the actual results of shad introduction on the west coast is the important bearing which the success of the experiment must have in determining the outcome of artificial propagation in regions in which it is not possible to distinguish with satisfactory accuracy the natural from the artificial conditions. If these far-reaching, and no doubt permanent, results attend the planting, on few occasions, of small numbers of fry in waters to which the fish are not indigenous, is it not permissible to assume that much more striking consequences must follow the planting of enormous quantities of fry, year after year, in native waters? There is no reasonable doubt that the perpetuation of the extensive shad fisheries in most of the rivers of the Atlantic coast has been accomplished entirely by artificial propagation. On no other supposition can the maintenance and increase of the supply be accounted for.

The introduction of the striped bass was accomplished in 1879, when about 150 fish a few inches long, taken in Shrewsbury River, N. J., were successfully carried across the continent and deposited at the mouth of the Sacramento River by an agent of the U. S. Fish Commission co-operating with the California Commission. Six or seven months later an example eight inches in length was reported from Monterey Bay, one hundred miles south of the locality where planted, and in eleven months another specimen twelve and a half inches long, and weighing one pound, was caught in San Francisco harbor. This very rapid growth indicated the special adaptability of the waters of the region to this fish. In 1882 another plant, consisting of 300 fish, was made in the same region by the California authorities. As a result of these two small deposits, the species soon became distributed along the entire coast of California; its occurrence, however, in the other States of the region has not yet been determined.

The history of the striped bass is similar to that of the shad. It has attained considerable commercial importance, has increased steadily and rapidly, and is generally regarded as one of the best food fishes of the coast. It has not yet attained anything like the abundance of the shad, nor was this to have been expected from the meagre plants, but there seems to be no reason to doubt that it is only a question of time when it will become one of the most prominent economic fishery products of the region as well as a favorite object of capture by sportsmen.

The largest quantities of striped bass are taken for market in San Francisco Bay with seines and gill nets. The fish are found in greatest numbers between October 1 and February 15, but occur in some abundance at all seasons. Their average weight is eight or ten pounds, but fish weighing forty pounds are not scarce. The estimation in which they are held may be judged from the market value. In 1888, the ruling price in San Francisco was one dollar a pound; in 1892, owing to an increased production, it had dropped to twelve and a half cents. The catch in the latter year was about 43,000 pounds, for which the fishermen received $5,350. The aggregate yield to date may be estimated at nearly 100,000 pounds, with a value at first hands of about $18,000. The transportation of striped bass to the Pacific being undertaken conjointly with that of a number of other fishes, it is probable that the proportional cost of introduction was not more than a few hundred dollars.

TECHNICAL EDUCATION.

BY ALEXANDER MEEK, MUSEUM, PETERHEAD, SCOTLAND.

MR. MORSE has recently, in the *Atlantic Monthly*, advocated, and very ably, the extension of museums into the smaller towns. The success of the public libraries is as well known on this side as in America, and where museums have been established they have also been largely taken advantage of. And thus it is only fair that some definite purposes should be kept in view in their formation and in their arrangement. Such purposes the writer has set down elsewhere*, and there is little indeed to add or object to in the article above mentioned.

I hope soon to publish a description of a local museum, which has long had a quiet and dark existence in Peterhead, but which, with the institution of a reading room and free library, is now properly housed. The removal has been made the occasion of a complete revival and rearrangement in new cases. We hope to have it opened in a week or two.

There is no doubt at all of the educational value of such institutions. The pity is that so many are hampered by want of funds to carry on the work and to provide a neat-handed, educated person to look after the collection. Were it possible to build such museums and libraries with other educational activities, I fancy the solution of the problem of providing for education, even in remote districts, would be brought to practicable ground and might be gone on with at once.

Let me tell those who read *Science* one direction which education has recently taken in this country, and some thoughts that are suggested for its continuance and furtherance.

In towns, the youth who takes up a work or profession, is led at once, by contact with his fellows, to attend University or Evening Technical classes, where he learns principles underlying his daily work. But in the country districts, until lately, little attempt has been made to instruct farmers and fishermen.

And like all similar attempts, even when made in towns, the failure of the work was by many guaranteed. Those who have passed from school to university, who have devoted themselves to some special department of learning, furnish often the worst enemies to the scheme. But the funds came suddenly, and the trial was made. Well, it may be granted at once that an itinerant instructor can do very little real teaching, but if he can successfully, every night of his course, hold up an attractive picture of scientific work and its results to those in front of him, he should, if well trained, find that his work is not unavailing, that it is possible to thus stimulate an interest in the questions he handles, and then the free libraries are called upon that the pupil may follow it up. I can vouch, from my own experience in this field, for the interest taken in the lectures and for the encouraging enthusiasm evinced by those who attend—many travelling six miles for the purpose. The interest shown, of course, is due, in my case, to the country audience being so directly interested in my subject—the *Farm Animals*.

But still there is here, as with the museums, the want of co-ordination. Not only is such instruction very much needed in the country, and the desirability of the schoolmasters taking the great share of it, but a number of good central institutions in the larger towns where such a complex subject as agriculture could be taught by competent teachers in all the departments and with which the schoolmasters and itinerant instructors would have direct connection.

Should such an extension be adopted in America, I think you will see the desirability of having it emanate from such institutions of agriculture as are to be found in Germany, and as in Guelph, Canada, on your side.

With the schoolboards, the Science and Art Department and the Technological Institution in London, and the County Councils, not to add universities, free libraries and museums, we have institutions enough in Britain, but their want of connection and independence of effort are much to be deplored.

It would be invidious in a journal like *Science* to discuss how that may be done. But for the purpose alike advocated by the writer in the *Atlantic Monthly* and of extending education into the country, such co-ordination is to be recommended.

*Transactions of Buchan Field Club for 1893, etc.

PALENQUE HIEROGLYPHICS.

BY PH. J. J. VALENTINI, 351 LENOX AVE., NEW YORK CITY.

I HAVE prepared a memoir, in which an accurate account is given, both of the sculptured centre-picture set into the rear wall of the so-called Temple of the Cross, Palenque, and of the text contained in the 201 squares of hieroglyphics on the two lateral tablets.

Since the discovery of this temple by J. Lloyd Stephens, in 1849, this text has been the subject of much speculation. It was thought to tell the migratory and colonial history of the fabled Toltec nation. It was imagined to be written in hieroglyphics capable of being deciphered by the aid of a proferred alphabet. Neither of these speculations will stand the test.

As to the structure itself, it stands on a small tumulus, and was devoted to the memory of a defunct priest, whose name does not appear. But his portrait seems to be represented in the large sacrificial scene. He is offering the idol of *Chac* to the sacred *Quetzal*, this bird being perched on the top of the *Tree of Life* (yak-die), the latter standing on a pedestal in the shape of a grotesque human skull.

The purport of the left-hand tablet, as may be inferred from certain peculiar features and their arrangement, is that of a brief abstract of the records of the Palenque Temple. The other lateral tablet appears to contain a sort of biography of the dead priest.

With the exception of only two symbols of the twenty Maya days, the remaining exhibit the same features as are known from Landa's work and the extant codices, only that they show themselves in most elaborate form.

No symbol for the month makes its appearance on these tablets. Mr. Foerstemann's theory of reading double-columns is untenable; consequently, also, that of his day-symbols allied to month-symbols. The one is contradicted by the conspicuous separation of the columns themselves and by many other reasons. The other is refuted by literary statements. Landa's pictures of month-symbols are not the traditional ones, but fanciful suggestions.

There is no trace on the tablets of the Mexican Tonalamatl reckoning, but, rather, of that of the ancient Tulan (Palenque) vigesimal system.

A phonetic base underlies the text neither as a whole nor in part. The hieroglyphics are of pure ideogrammatic nature. Moreover, the eye will not meet any object *profane*. The squares show only objects *sacred*, belonging to the cult, the temple, or such as were brought to it with the purpose of sacrificial offerings. Their identification offers no difficulties. Almost all of them were described and discussed by Landa.

At the suggestion of the lamented Professor Baird, Smithsonian Institution, this memoir was begun in 1873. Its substance was ready for print in 1877, when I made an agreement with Dr. Rau, that he should first publish the description of the Palenque tablet, No. II., which stands preserved in the National Museum, and I then fol-

low giving the interpretation of the sculpture in full. Meanwhile, time, as well as the profound studies made in Maya archæology by various scholars, has contributed to perfecting the work in hand.

Deficient though it may be in many minor parts, I am desirous of publishing my views on this subject without further delay and of thus at last redeeming the pledges given.

HUMBOLDT AND BRAZIL.

THE statement is often made, even by Brazilian writers, that not only were express orders given by the Portuguese government to prevent the entrance of Humboldt in Brazilian territory but that a price was set upon his head in case he was found within the limits of the colony. A recent interesting discussion in the columns of the *Jornal de Commercio*, of Rio de Janeiro, has brought to light the official documents relating to the case, which is thus seen to be less discreditable to the Portuguese government than is usually represented. It is to be remembered that prior to the removal of the Portuguese royal family to Brazil, in 1808, the colonial policy was an exceedingly narrow one, and that foreigners were jealously excluded from all the colonial possessions.

A official letter from the minister of the kingdom, Dom Rodrigo de Souza Coutinho, to the governor of Para, Dom Francisco de Souza Coutinho, with the date of June 2, 1800, states: "It being reported that a certain Baron Humboldt, native of Berlin, has travelled in the interior of America, has sent home geographical observations of the countries traversed, and a collection of 1500 new plants, and that he intends to direct his voyage to the upper parts of the captaincy of Maranham in order to examine desert regions up to the present time unknown, and as in the actual state of affairs this voyage without special orders of His Majesty is suspicious, you will cause to be determined with the greatest exactness and care if this or any other foreign traveller is travelling, or has travelled, in the territory of this captaincy, and in the affirmative case you will impede the continuation on such investigations, prohibited not only to foreigners but also to suspicious Portuguese not authorized by royal orders." The letter terminates recommending "the greatest circumspection, communicating at once to His Royal Highness, through this department of state, in order that he may take the steps required by faults of this nature."

In consequence of this order, Dom Diogo de Souza, governor of Maranham, sent a circular letter, under date of Oct. 12, 1800, to various local authorities, "recommending that if by chance the said Baron Humboldt, or any other foreign traveller, appears in your district, you will have him conveyed, with all his companions, to the capital, *without, however, failing to treat him with all decency, nor to give him good treatment and conveniences*, only accompanying him and impeding his means of transportation and the making of political and philosophic observations."

Concerning this matter an interesting letter from Baron Eschwege to Humboldt has appeared, in which he communicates that he learned from his friend, Antonio de Araujo e Azevedo, Count da Barca, who had been Portuguese minister at La Hague, Paris, St. Petersburg and perhaps, also, Berlin, where he had probably made the personal acquaintance of Humboldt, and who was afterwards prime minister in Brazil, that learning of this order, he wrote at once to the prince regent, begging not only its prompt revokement in order not to attract the reproval of all Europe, but that orders should be given to aid Humboldt in every way, and that such orders were actually given.

It thus appears that even the narrowest of Portuguese statesmen did not go to the length that is generally believed by their descendants and countrymen, and that enlightened men like Count da Barca were not lacking in Portugal at that time. Coming to power, a few years later, this statesman was the principal protector of Eschwege and the other foreign travellers that, after 1808, were allowed to penetrate freely in the interior of Brazil.

REMARKS ON THE TERNS OF LITTLE GREEN ISLAND, MAINE.

BY ARTHUR H. NORTON, WESTBROOK, ME.

THE Little Green Island is located to the southwest of Penobscot Bay, about 55° N. lat., 69° 2 W. lon. About a mile north the Northern or Eastern Triangles, a group of sunken ledges, some rising above the surface a little before and after high water, are scattered, noted as fishing grounds, as good gaming places, and as places to be especially avoided by mariners. The place is about seven or eight miles from the nearest mainland, a round rocky island inhabited only by sea birds and such organisms as find a suitable dwelling-place here—excepting the birds, probably nothing higher in the scale than insects. Throughout the year it is visited by gunners and fishermen, who often camp for a few days, or mayhap, throughout the summer season.

This was formerly one of the largest tern resorts in the vicinity, though to-day it is interesting only in a historical sense. It had for years been visited by fishermen, who came on picnics to gather the eggs of the "medericks," or terns, *Sterna hirundas* and *S. Paradisæa*. As they killed very few of the birds, and only took the eggs that were sufficiently fresh to sink in a dish of water, no serious reduction in the numbers of the "medericks" was evident, until they were slaughtered for their plumes or breasts.

I first visited the place, and beheld the wondrous beauty and natural fascinations of this great population of birds, from June 16 to 18, 1885. It was a bright, fair day, and we arrived about noon, finding them in the midst of their daily labors. Our approach to the island aroused the solicitude of those nearest the sea, which rose from the ground in companies of considerable size, some to resettle on their eggs or resting places, while others were still rising; some struck out boldly to view us more closely and herald our approach in a strong, shrill voice, and were quickly joined by others coming from the sea, pausing for a moment, then hurrying to land or hanging overhead to vociferate angrily to the unabating numbers round us. Such was our reception, and from daylight until dark, of those days, every movement which we made was carefully guarded by those creatures. We found the nests all over the island, from the windrows of seaweed, left by early high tides, in the gravel and "popple stones" on the beaches, on the bald, jagged ridges of ledge, projecting seaward, back through the pasture land to the summit of the island.

That year the place afforded pasturage to a large flock of sheep, which kept the grass cropt short, furnishing unlimited nesting sites, as our terns dislike tall grass for breeding places. Some were mere depressions in the sand or grass, others contained a few feathers from the parent, straws, or pieces of seaweed, and occasionally they were quite well lined; and one found in July, which was placed about a foot from a wisp of drift hay, was lined with it to a remarkable degree, being compact and strong, truly a pretty specimen of bird weaving.

While wandering over the island we were accompanied by a restless, pleading throng, seeming like a dome of animated white flakes within the great, impassive dome of outer blue. Those that were more distant were settling

to incubate their eggs or to rest, and others rising to join the troop. While walking on opposite sides of the island we were made aware of each other's position and course by the vigilant birds surrounding.

The nests contained one, two or three eggs, usually fairly well advanced in incubation. One nest contained four eggs, the only case which we noted, and we probaply examined hundreds of nests. Mr. Rackliff, my companion, who had visited the place for quite a term of years previous, and had probably examined thousands of nests in all, remarked that this was the second time that he had seen more than three eggs in a nest.[1]

While fishing at the Triangles and shoals around the island, the terns were our constant companions, approaching closely to our boat, hoping to secure refuse from the bait, or dressings from the fish. With fishermen, it is an unpardonable display of slackness "to dress down on the ground," and the small-boat fishermen usually dress on the beach or in harbor, or mayhap, on the trip to shore. Hence the terns were accustomed to gather in compact companies at these dressing stands, and at the Green Island beach I have seen them so closely crowded that it seemed wonderful that they could move without coming in contact at every sweep—a sight that prompted the "salts" to relate tales of slaying several at a single stone's throw through the mass, or of greater gatherings at other times.

Of this matter they seemed to feed but very little to their young, though the adults would become gorged with it and drop out from shore to alight on the water, drifting whither the wind and tide listed, occasionally rising to flap a short distance and resettle. During the heat of the day they were fond of basking in the sun, and at low water the Triangles and rocky points of the island were rendered especially attractive to the sight by the flocks of terns and Bonaparte's gulls reposing on their dark and treacherous brows; the whiteness of their plumages being suggestive of the soft white sea foam wont to settle there in the fury of the violent storms, whose sighs and groans have proven to be the funeral dirge of the mariners and their vessels which lie mouldering here.

The higher parts of the island and its beaches, especially the rocky ridges near the shore, were always adorned by their elegant forms, resting with stoical gravity. It required but a slight disturbance to send the whole gathering scurrying lightly through the air to a short distance, when they would return with inquisitive glances and impatient cries. They evidently incubated at intervals, at least, throughout the heat of the fairest days, and some were constantly going from or returning to their nests. Thus, when we were seated quietly on the beach, we viewed them in constant motion, their voices never quiet during daylight, and occasionally at midnight the wandering sheep provoked them to peals of solicitude or rage. Several times we found eggs trampled by the sheep, and it was a common sight to see a tern diving fiercely at one of these animals, to utter a prolonged syllable and rise for another dash, thus annoying it to make it move to another place. They often made similar dashes at us, coming within a few feet of our heads, and stories of their having pierced hats with their beaks were related by the fishermen. After the young hatched this boldness was more frequently displayed.

Raptorial birds were objects of intense hatred, and very seldom through the breeding season, it was claimed, ventured near the island. I had the good fortune to observe an osprey passing along the shore one day, and close behind followed a train of indignant terns vociferating wildly; and his hurried flight proved that it was an unpleasant company.

July 16 and 18 I revisited the place accompanied by my father, when many of the young were hatched out, and a very few were able to fly; still quite a large number of nests contained eggs. The downy young were very beautiful, their colors were pure, and their down faultlessly clean. The little creatures were weak, and cuddled among the pepples on the shore or in the grass on the uplands, and by the anxious clamor of the birds overhead were made conscious of a supposed danger, and without moving directed the gaze of their large black eyes at us, seeming to bear an expression of fear and pain for their helpless condition, which could not fail to move the feelings of the naturalist with pitying love.

Those that were partly feathered ran freely, as was indicated by numerous paths in the grass that now was several inches high and seeded, in places that had escaped the sheep. I "trailed" out several of these, and on being handled they maintained a rigidness of the body so perfectly that at first I wondered whether I had not found a dead bird; but the cautious expression of the eye quickly dispelled the presumption, and on my turning the little creature on its back, it quickly sought to recover itself, and as I retired a few feet, it waddled slowly for a few yards and settled snugly in the grass.

During this visit we spent considerable time fishing at the Triangles, and for the benefit of the birds threw the fish livers overboard. This never failed to gather a large company of birds, and they grew to expect this attention, and after a short time the birds that were near would come to look for food at a swing of the arm above the head. At first they were very cautious, often dipping down to the water, but instead of seizing the food would raise their heads to look for danger, and, as they never lighted, passed onward and up bearing the liver; or in some cases the flight was so hasty that the grasp could not be effected. Soon, however, they became perfectly fearless of us, scaling across the boat to secure pieces within three feet of the side, and on several occasions they brushed my hat with their wings. While thus feeding they swooped down, pausing and frequently touching the tail and toes into the water, bowed the head, and took the article in the bill to be swallowed in the air or rarely to be borne shoreward.

Viewed thus in their active, vigorous conditon, they exhibit their gracefulness and beauty in a most pleasing way, the pearly blue mouth, lustrous black cap reaching to their large eyes, which in their closeness seem glowing with excitement, the carmine bills and tiny red feet, long slender wings and undulatory tail-feathers, are especially noticeable, as they glide with arrowy swiftness, their slight bodies and close-set plumage being perfectly adapted to the aerial path which they pursue. Nature must have labored long and skilfully to produce a beautiful, active creature to inhabit these lonely and often desolate sea-isles through the pleasant summer season.

By sunset most of the great number had come ashore and settled for the night. A gun fired after they had become quiet seemed to have the effect of a dynamite blast, as the colony of birds shot upward like so many thousands of snowy fragments hurled to the darkening sky. One evening after dark, in my father's company, I sauntered out over the island where few nests were placed. As we gazed upward we could just discern the birds gliding in the dusky starlight overhead, having risen from their resting places on the ground.

Near noon of the 18th we sailed away, losing this colony of terns from view, not for a season, but forever. During the next year, 1886, the Little Green Island, through the magnitude of its tern population, attracted

[1] It is now not uncommon to find four, five and occasionally six eggs in a nest in Maine and Nova Scotia.

the attention of plumers, through whose depredations it became wholly depopulated in this single season, none breeding here in 1887 nor 1888, as I learned through a letter from Mr. Rackliff.

AN ANALCITE COPPER BOWLDER FROM THE KEWEENAW RANGE, MICHIGAN.

BY E. O. HOVEY, PH. D., NEW HAVEN.

In the Michigan exhibit in the mining building at the Columbian exposition there is a curious bowlder, or rounded mass, which deserves more than a passing glance from the visiting mineralogist. The bowlder was originally about four feet in diameter and approximately spherical in shape. It came from the Central Mine, Keweenaw County, and occurred near the contact between the ore body and the country rock. Possibly it was one of the contact phenomena of the region, and there may be other masses like it.

The bowlder is composed for the greater part of granular pink analcite with granular calcite and quartz quite evenly disseminated through it. It shows a tendency to spherical parting throughout the mass, which causes it to separate into concentric shells from one to two inches thick when broken into. Permeating the granular mass and holding it together, is an intricit net-work of arborescent native copper radiating outward from the centre of the bowlder. The action of dilute hydrochloric acid dissolves out the analcite and calcite, leaving the net-work of wire copper intact, with small grains of quartz caught here and there in it. The wires making up the arborescent growth are about 0.01 inch in diameter, but means for accurate measurement were not at hand. Under the microscope the net-work is seen to be made up of minute crystalline growths developed along axes inclined 60° to the direction of growth. The planes recognized were only the most common of those occurring on native copper; viz., the cubic, octahedral and dodecahedral. The terminations of the little branches are usually acute, and formed by the acute solid angle of the dodecahedron; but an occasional blunt point occurs made up of what seem to be cubic planes. The vertical axes of the crystals are approximately the radii of the spherical mass, and the extremities of the little branches all point outward. A low estimate places the amount of native copper in the bowlder at from 35 to 40 per cent. The crevices in the mass are stained green by the decomposition products of the copper.

The chief component of the bowlder and the one which gives it its color is pink analcite, recognized by its faint cubic cleavage, its vitreous lustre, inclining a little to pearly, and its gelatinizing with dilute HCl. The granular structure is so pronounced that the mass would crumble to pieces between the fingers, if it were not for the retaining net-work of copper. Disseminated through the analcite are small aggregations of granular white quartz, while associated with both analcite and quartz are minute particles of calcite, which occur in sufficient quantity to produce marked effervescence when the rock is placed in acid. The copper penetrates all components of the rock alike.

The peculiar structure of this mass was noted by Mr. Samuel Brady, M. E., of Detroit, superintendent of the Michigan mineral exhibit, and the bowlder secured for the display at the exposition. A more detailed account of the mass and its occurrence will appear in Mr. Brady's report on the exhibit, but he kindly gave me permission to prepare this preliminary notice for the readers of *Science*.

LOEW'S NATURAL SYSTEM OF THE ACTIONS OF POISONS.

BY J. CHRISTIAN BAY, MISSOURI BOTANICAL GARDEN, ST. LOUIS, MO.

Hitherto, the actions of poisonous substances were regarded mainly in connection with medical science or, when submitted to a general view, were mainly considered in their relation to certain physiological conditions of the mammals, or with reference to pathology. A review of poisonous actions was extended only as far as we could go with regard to the chemical composition of the matter acting, and with the pathological state of the whole organization upon which it exerted its influence. Thus, in 1862, Taylor established a classification of poisonous substances into mineral, vegetable, neurotic, spinal, and cerebro-spinal poisons. But this division did not, in the first place, cover all instances of which we had a record. Further, it was not, for logical reasons, really satisfactory.

The grand development of bacteriology, and much ingenious work in investigating the structure and physiological properties of the living matter, have extended our positive knowledge as well as our views, and special attention has been paid to the physiological unit of the cell. In this journal the writer[1] called attention to Sachs'[2] theory of the energids, in the *Botanical. Gasette*[3] he called attention to Wiesner's magnificent work[4] in similar direction, and Detmer's[5] recent contribution, which, though they go in different directions, can very well extend and be supported by each other.

Through many special papers and occasional notes, our knowledge of the actions of poisons has been extended, since the old school of physiologists saw other systems of knowledge come forth. In this connection, attention should be called to the work of Pereira and Buchheim[6]. Now, however, the facts are arranged in a totally new, very logical and natural way, by Dr. O. Loew,[7] of Munich, who has established a natural system of the actions of poisons, corresponding with our present knowledge and views of the elementary units of the animal and vegetable body.

Loew arranges poisonous actions according to their way of action upon the organization, thus establishing a physiological system. This is to be preferred to any other, because many of these actions open views into the chemical and physiological properties of the protoplasm and its constituents. The support of this system is Pflüger's theory from 1875[8] that the properties of living and dead matter (or matter in the living and dead state) are intimately connected with the properties of the organic proteid combinations in the protoplasm. This question was, in 1882 and later, subject to exceedingly careful and important experimental studies by Loew and Bokorny,[9] the result of which being that the albuminoid matter of the protoplasm of plant cells in the living state differs greatly from that in the dead state. Much opposition against the conclusions from the many important facts herewith connected results mainly from lack of understanding of these questions, while, on the other hand, there are good reasons for opposing. The *facts*, however, cannot be rejected.

1 Science, XXI., p. 162, 1892.
2 Flora, Regensburg, 1892, pp. 57-64.
3 Bot. Gaz., XVII., 1892.
4 Die Elementarstruktur und das Wachsthum der lebenden Substanz. Wien, 1892.
5 Berichte der Deutschen Bot. Gesellschaft, X., p. 433-441, 1892.
6 Pereira: Handbuch der Heilmittellehre, übersetzt von R. Buchheim. Vol. I-II.
7 Loew, Dr. Oscar: Ein naturliches System der Giftwirkungen, Munchen, 1893. The work is dedicated to Professor von Pettenkofer on his 50 years' doctor-jubilee.
8 Pfluger's Archiv f. d. ges. Physiol. des Menschen und der Thiere, Vol. X., 1875, p. 300. See also Detmer: Pringsh. Jahrb. XII., and his Pflanzenphysiologie, 1883, p. 149-153.
9 Die chemische Kraftquelle des lebenden Protoplasmas, 1882. See also Biol. Centralbl.

The structure of the active albumen is highly labile, it is easily altered, and transformed into an inert mass. The protoplasm, being equally labile, *possesses its vital force in consequence of the balance between the attractive and repulsive forces of the proteid molecule.* When this balance is disturbed by an excess of the attractive power over the repulsive, we have a disturbance of the vital power. It must be confessed that this theory explains well the death of the living matter.

From this foundation Loew builds up his theory. With wonderful patience he has collected the notes from the literature, and succeeded in bringing together a reference-work of high rank, while, at the same time, original observations are frequently broadening out the scope and giving numerous suggestions for further investigation. As the work is altogether a work of facts, only a general view will find its place here.

The system is the following:

A. General Poisons.
1. Oxidizing poisons.
2. Catalytic poisons.
3. Poisons operating through the formation of a salt.
4. Substituting poisons.

B. Special Poisons.

1. Poisons which affect solely such acting albumen as has a special configuration and lability: toxical proteids.

2. Poisons which have a destructive effect on the structure of the cells, in consequence of their association with the active albumen of the protoplasm.

3. Poisons which have an indirect effect;
(*a*) checking the breathing power,
(*b*) acting by their own decomposition,
(*c*) altering the swelling up of organic bodies.

The toxical proteids (chapter V) are treated in full. "The discovery by Hammerschlag in Nencki's laboratory (1888) that a poisonous proteid could be isolated from the *Bacillus tuberculosis*, was succeeded by the important observation by H. Buchner (1889) that certain proteids are present in the blood of certain animals and have a poisonous effect on bacteria. Emmerich had already, in 1887, shown the destruction of bacteria in the circulation; then he succeeded in showing that the bacteria-killing properties of the blood rested in the albuminoid substances contained therein."

The multitude of facts makes it possible to give only the main features of Loew's theory here. Everybody who is interested in physiology and its progress knows that we must have views as well as facts in order to secure a constant progress. The importance of the new theory will be felt by all who are interested in medical science; it is one of the steps that show us that the time has come for establishing a special general physiology of animals and plants. All this made it a pleasure to the writer to turn the attention of fellow-workers towards it.

SOME OHIO MOUNDS.

BY HAROLD HEATH, DELAWARE, OHIO.

During the last few years several mounds in central Ohio have been entered and some of the data obtained has proved to be of considerable interest. Mounds similar to these have long been described under the title of Funeral Tumuli and Sacrificial Mounds, yet their true function seems to be doubtful even in the present day. They were about of equal size, varying from 40 to 50 feet in diameter and 15 to 20 feet in height, and without exception were situated upon some water course. In the cases where the land was still undisturbed a layer of vegetable mould covered the surface to a depth of between two and three feet. Beneath this covering came a layer of fine sand and gravel similar to that found in the sand bars of streams or rivers. This layer was always four or five feet thick. In making shafts extending perpendicularly through the centre of the mound, after passing through this gravelly layer, a rough altar was reached in four cases out of six, and in the other two ashes and charcoal were found. These altars were constructed of unhewn, waterworn bowlders piled in a rude fashion to form a mass having the average dimensions of 5.3 feet in length; 4.1 feet in width, and 2.4 feet in height. In two other cases, which have come to my notice, skeletons, evidently Indian, were found in this gravelly superficial layer above the altar. One skeleton was especially remarkable for its height, measuring when put up a trifle less than six feet. About and upon the altars were scattered ashes and charcoal, and dark masses of vegetable mould indicated decayed bits of wood. Portions of human skeletons and in one case that of some carnivorous animal were found, many pieces in a charred condition, indicating either human sacrifice or cremation. These altars were built before a rude pavement of stones similar to those composing the altar and were of about the same size, viz., about a foot in diameter. Beneath this lay a mixture of blue and yellow clay and gravel making up the greater portion of the mound. In one case layers of gravel stones about the size of a cricket ball were encountered lying in strata separated by about a foot of this clay-gravel mixture. These layers extended through a depth of nine feet. This "cement" was so compact and hard as to withstand almost like stone the most persistent attacks with pick and shovel. In most cases the work was abandoned after sinking the shaft to a depth corresponding to the height of the mound, although the clayey cement indicated that the lower surface of the structure had not been reached. In only one case when a depth of nineteen feet had been reached by means of excavations and blastings was a skeleton found. This was the skeleton of a man 5 feet 1 inch in height and it was so fragile in the damp tenacious clay that only portions of the bones could be extracted. The body lay partially upon the right side, one hand lying across the breast, the other extended along the side. The left leg was considerably flexed, while the right was extended. Lying at the side of the skeleton were two stone beads, a perforated bit of unio shell and two flakes of mica. A further excavation of six feet, and also large tunnellings at the foot of the shaft, failed to bring to light any more bones or implements.

In two other mounds implements were found in this thick cement—an axe in one and two fleshers and several rough spear heads in the other. In other localities a few cases have been reported where a kind of vault was found a short distance beneath the altar, containing one or more skeletons and generally some implements or ornaments, but so far as I can determine no such report has been made for this section of the country.

AN EYE PROTECTOR TO BE USED WITH THE MONOCULAR MICROSCOPE.

BY L. BREWER HALL, M. D., PHILADELPHIA.

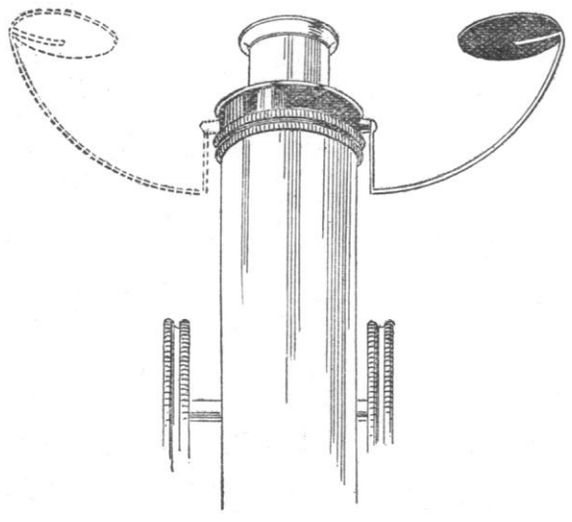
How often have we heard persons exclaim, upon looking into a binocular microscope for the first time: "Oh, how much easier it is to see with this instrument, and how much plainer everything appears;" and this *with one field quite dark*, which provokes a smile from the amateur. I am fully convinced, however, that we cannot ascribe such expressions wholly to dissimulation or flattery, or even self-deception, and for the following reasons:—

When one eye is looking through an instrument like the microscope, and the other, being open, is regarding the objects outside the tube, an image is formed upon each retina, and the normal action of the mind is to blend them into a single picture. This being impossible from

the difference in the objects, a strong mental effort is required to disregard the impression in one eye, and fix the attention upon the other only. Again, when we close one eye by the contraction of the orbicular muscle, or by pressure, as with the hand, we cause contraction of the accommodating muscle, also, and that of the open, occupied eye, as well. I have proof of this many times each day while examining eyes by the ophthalmoscope; but we are all familiar with the spasm in *both* eyes when a particle of dust is beneath the lid of one only; and, again, we are conscious of an effort amounting almost to an impossibility, before training, of keeping one eye open and the other shut.

Both these conditions are present and are factors in the fatigue which accompanies the use of a monocular instrument, and are strong reasons for employing a binocular one, when possible. Of course, each form has its own especial use and place, but this is not our present purpose to discuss. It is to overcome these sources of fatigue in the use of the monocular instrument that an eye-protector is used.

When anything is placed far within the focus of an eye no image of it is formed upon the retina, and it becomes invisible. If, then, it should be opaque and large enough to cover the whole field of vision, it is not only invisible, but shuts off the sight of all other objects as well, leaving the mind free to attend to the image on the retina of its fellow. On this principle quite a number of devices have been proposed and used, among which a plain card, perforated and slipped upon the tube, has been, perhaps, the most frequent. This has to be placed low down in order to be out of the way of the face, and thus requires to be so large to cover the field of vision that it hides the stage and interferes with the adjusting screws.



Another consists of a small plate extending horizontally from the cap of the ocular. In this the edge must be cut away to admit the bridge of the nose. This gives it a curved form, and prevents its being used before each eye alternately, except by removal and inversion. It must also be removed with each change of ocular. These removals and replacings demand so much time that most workers think it hardly worth the trouble.

The form that I have found satisfactory, after use for several years, consists of a small disc of blackened brass, about the size and shape of a spectacles glass, and supported near the eye by a wire extending from its outer margin obliquely downward to a point on the tube low enough to be out of the way of the nose, then bent upwards, parallel to the tube, but not touching it, and attached to a cut-ring which clasps the top of the draw tube beneath the ocular. The accompanying drawing shows it in place, and will need no further explanation.

The advantages of this form are: First—The small size of the disc and support interfere the least possible with the adjusting screws and view of the stage. Second—It is easily adjusted to the eye-distance of any worker. Third—It is not in the way of the nose. Fourth—It can be easily swung around before either eye, without removal. Fifth—It is not disturbed in changing oculars. Sixth—Any mechanic can make one at a small expense. The one I am using was made by Zentmayer, of this city.

LETTERS TO THE EDITOR.

***Correspondents are requested to be as brief as possible. The writer's name is in all cases required as a proof of good faith.

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

BIRDS THAT SING BY MOONLIGHT.

THE reading of the very interesting article in *Science* for Dec. 2, entitled "Birds That Sing in the Night," by Morris Gibbs, brought vividly to my mind the pleasure I have felt in listening to nocturnal bird music.

The birds which I have most frequently heard sing at night here in southeast Kentucky are of different species from those mentioned by Mr. Gibbs, prominent among them being the Oven-Bird (*Seiurus aurocapillus*), which, although I have never seen any mention of the fact in print, sings regularly on moonlight nights.

On such occasions the song is usually the extatic, quivering jumble of warble and twitter so often heard from this bird at dusk, when he flies in zig-zag lines and short curves up above the tops of his native woods, and as quickly descends, all the time bubbling over with melody.

Almost every bright moonlight night in spring and early summer this song may be heard at intervals, breaking with silvery sweetness into midnight's tranquility.

Another bird, often heard on moonlight nights, though by some it is not considered worthy the name of a song, is that of the Yellow Breasted Chat (*Icteria virens*).

The Cuckoos are also often heard by moonlight during their southward migrations after all the resident individuals have departed.

I have frequently noticed that a bright fire in or near the woods at night called forth sleepy chirps and snatches of song from various species of birds. JOHN B. LEWIS.

THE CAMBOJAN KHMERS.

HAVING some time ago carefully studied the question of the origin of the Khmers of Cambodia, and the result of my enquiries having been published in the *Revue d'Anthropologie* (3rd Ser. Vol. I, 1886, 2d fasc.), under the title of *Les Cambodgiens et leur origine*, I may perhaps be allowed to make some remarks on Prof. A. H. Keane's letter which appeared in *Science* for August 4. That the Khmers belong to the white race, whether this be called Caucasian or not, cannot well be denied, and Mr. Keane is doubtless entitled to the credit of having first pointed out the fact. But that the Khmers are, as he states, true aborigines in the country where they are now found is very questionable, and indeed the best French authorities agree with Dr. Maurel in deriving them from India. The date of their arrival in Cambodia is given by M. Moura, and is fixed by the annals of the ancient Cambodian empire as having taken place about 543 B. C. According to the view elaborated in the paper above referred to, the ancestors of the Khmers were allied to the Tandavas of the Hindu epic, the Mahabharata, and I have endeavored

to prove that they belonged to the Rajpoot-Jat stock of N. W. India.

As to the language of the Khmers, M. Moura, judging from the fact that it contains many Sanskrit or Pali words, supposes it to be of Sanskrit or Pali origin, which agrees with the Indian origin of Cambodian civilization and religious ideas, but not with Mr. Keane's statement that the language of the Khmers is "radically distinct from the Indic (Sanscritic branch of the Aryan), but closely allied to the untoned polysyllabic Malayo-Polynesian linguistic family." M. Moura affirms that "one of the distinctive features of the genius of the Khmer language" is its monosyllabic form. How far this is consistent with its supposed Sanskrit or Pali affinity I am not concerned to say, although it is noteworthy that words derived from Pali have been reduced by shortening to the monosyllabic form. From a comparison of the vocabularies given by M. Moura, I much doubt whether there is so close a relationship between the Khmer and the Malay languages as Mr. Keane supposes. The latter is more nearly related than the former to the primitive Cham, and while Malay has derived certain foreign elements from the south, the Khmer has obtained its foreign elements from the north. On this subject I would refer to a paper by myself on "The Asiatic Affinities of the Malay," published in the Proceedings of the American Philosophical Society, Vol. XXVIII., June 3, 1890. In any case, I cannot see how the fact of the Khmers having untoned polysyllabic speech could be evidence, as supposed by Mr. Keane, that they were aborigines, nor is this proved by the existence of allied so-called wild bribes.

C. STANILAND WAKE.

Chicago, Aug. 12.

OREGON WAX.

IF Mr. C. D. Hiscox will refer to the letter of Mr. James Wickersham, in *Science* of July 7th, he will find that the wreck origin of the Oregon wax is not an "absurdity." Having examined specimens of the wax in question I beg to state that it has nothing in common with ozocerite, with which I am perfectly familiar, but is apparently beeswax, pure and simple. It is of a yellowish-brown color, with granular fracture, and is lustrous on cut surfaces, but not resinous. Its odor is honey-like and characteristic. A hasty chemical examination for cerotic acid showed 6.7 per cent in a sample cut from near the surface of one of the lumps, this figure being low for pure wax and yet rather higher than is usually the case in the impure, so-called, beeswax of commerce. Mr. Hiscox will remember that ozocerite yields no free acid on treatment with alcoholic potash.

CHARLES PLATT.

Buffalo, July 25.

BACTERIA IN HENS' EGGS.

IN *Science* of August 4, Mr. Brannon asks for some information in regard to the decay of eggs.

Some two years ago a student in the hygienic laboratory was given the problem to determine whether the putrefaction of eggs was due to bacteria entering the egg as it passed through the oviduct or through the shell after the egg was laid. The results obtained were not satisfactory or conclusive, but as they may throw some light on the subject they are given (from memory) for what they may be worth. Many cultures were made from stale eggs in order to determine whether the putrefaction was due to a specific germ or to a number of different germs. Several species were found.

A healthy, laying hen was obtained and after repeated washings in a solution of bichloride of mercury, followed by sterile water, she was placed in a sterilized cage. The hen continued to lay regularly every other day. The eggs were obtained as soon as possible after being laid, and a portion of them were placed in sterilized cotton and then in an incubator. If my memory is not at fault, all of those eggs decayed and swarmed with bacteria.

The remaining eggs were taken as soon as laid, and cultures were made from their contents. Some of these culture tubes developed; others remained sterile.

After some days the hen was killed, and with proper aseptic precautions culture tubes were inoculated from various portions of the oviduct. Most of these tubes developed. It would seem from this one case that the

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putrefactive bacteria entered the egg in its passage down the oviduct and before the shell was formed.

But to conclude that all eggs when laid contain putrefactive bacteria is not warranted. It is a matter of common household observation that a few eggs do not decay, no matter how long they may be kept, and the further fact that eggs packed in some dry material, as sawdust, salt, etc., and those greased or coated with gelatin, etc., seem to keep longer than those left in the open air, would seem to indicate that the bacteria enter through the shell.

I regret that these experiments were not completed.

The point is one of considerable hygienic and even commercial importance and one that needs but a little careful work to settle beyond question.

CHARLES T. MCCLINTOCK.

University of Michigan, Ann Arbor, Mich., Aug. 11.

CORRELATION OF TEJON DEPOSITS WITH EOCENE STAGES OF THE GULF SLOPE.

WHILE comparing the Texan Eocene fossils with type specimens and others in the collection of the U. S. National Museum and in the Philadelphia Academy of Natural Sciences I have been impressed with the remarkable sameness in faunal characters throughout the vast extent of the lower Claiborne, or Lisbon, horizon; many of the species from South Carolina are identical with those from the banks of the Rio Grande, and the rocks from Ft. Téjon, California, furnish a very similar fauna with several identical and many more analogous species. Gabb's *Cardita hornii* is *Venericardia planicosta* Lam. as held by Conrad; the type specimen is slightly malformed and imperfect, but others from the same locality are quite typical *planicosta*. Gabb's *Architectonica cognata* is Conrad's *Solarium alveatum;* Gabb's *Architectonica hornii*, Conrad's *Solarium amœnum;* Gabb's *Neverita secta*, Conrad's *Natica œtites*, and so on. Gabb's peculiar and characteristic little *Whitneya ficus* is known from Alum Creek Bluff, Colorado River, Bastrop Co., Tex., and is in itself a strong argument for the synchrony of the Texan and California beds from which it is derived. Moreover, in deposits of this horizon on both sides of the Rockies, there are similar developments in the genera *Crassatella, Cytherea, Pyrula, Levifusus, Rimella* and others.

With the above facts in mind I cannot help suggesting that those who have an opportunity to study the Eocene series of California (Téjon deposits) would do well to look for the Midway stage which ranks second in persistency among the subdivisions of the Eocene along the Gulf slope. In other words search should be made along the Chico-Téjon contact for such species as *Enclimatoceras ulricii, Cucullæa macrodonta, Ostrea pulaskensis,* together with varieties of *Venericardia planicosta, Turritella mortoni, T. humerosa*, and other Midway forms.

GILBERT D. HARRIS.

Geological Survey of Texas, Washington, D. C., Aug. 1.

AN ADDITION TO THE MYOLOGY OF THE CAT.

IN St. George Mivart's book on the cat there is to be found one of the most extensive articles on feline myology ever written, nevertheless there seems to be a muscle in the hind foot not mentioned in his work or anywhere else as far as I can ascertain. It takes its origin by a broad flat bundle of fibres from the outer side of the Os Calcis immediately below the anterior prominence, these run obliquely forwards forming a comparatively broad, thin tendon, which blends on the plantar surface with, for the most part, the Flexor-longus-pollicis, where it joins the Flexor-longus-digitorum-pedis, but a few fibres of the tendon go to the latter muscle.

It is innovated by a branch from the external plantar. That this muscle is not an abnormity I am quite sure as it has been found in 25 subjects from the vicinity of New York and one from Italy.

JOSEPH W. THOMPSON.

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"The Conchologist: a Journal of Malacology," Vols. 1 and 2, with wood cuts and plates, value 12 ; will exchange for any works or pamphlets on American Slugs or Anatomy of American Fishes. W. E. Collinge, Mason College, Birmingham, England.

I wish to exchange a New Model Hall Typewriter, price $30, for a Daylight Kodak, 4x5 preferred. George A. Coleman, Dep't. Agric., Div. of Ornithology, Washington, D. C.

Exchange—The undersigned is desirous of obtaining correspondents interested in macro-lipidoptera, in Alaska, the far Western, Southwestern and Southern States. Will also exchange rare lepidoptera for entomological literature. Levi W. Mengel, Reading, Penn.

Wanted to exchange—Medical books, Obstetrical Transactions, London, Works of Sir J. Y. Simpson, Beck's Medical Jurisprudence. Handbook for the Physiological Laboratory, by Burnton, Foster, Klein and Sanderson, Quain's Anatomy, and about fifty others. Catalogues given. Want Geological, Botanical and Microscopical books in exchange. Dr. A. M. Edwards, 11 Washington St., Newark, N. J.

A complete set of Bulletins of U. S. Geological Survey, various reports and bulletins of surveys of Missouri, Arkansas, Minnesota, Alabama, Illinois, New York, Pennsylvania, Indiana, Ohio and Texas; iron ores of Minnesota; Wailes' Agriculture and Geology of Mississippi (rare). To exchange for periodicals and books on Entomology or for Lepidoptera. Rev. John Davis, the Deanery, Little Rock, Ark.

Wants.

I WOULD be grateful to receive replies to any of the following questions.—Is copper found native in Mexico? Is it found native in Cuba? If so, in either or both cases can I purchase authentic specimens? Can any one furnish me with results of analyses of native Mexican or Cuban copper, also analyses of unalloyed copper reduced from the ore from Cuba or Mexico? Is it possible to procure aboriginal implements of copper from Cuba or Mexico? Answers to these questions will greatly aid the preparation of a report for a scientific institution. C. B. Moore, 1321 Locust St., Philadelphia, Pa.

WANTED.—J. W. Draper's book, the forces producing the organization of plants, 1844. Wanted for my private library. Address J. Christian Bay, Missouri Bot. Garden, St. Louis, Mo.

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WANTED.—Assistant in Nautical Almanac office, Navy Department. The Civil Service Commission will hold an examination on August 15 to fill a vacancy in the position of assistant (computer) in the Nautical Almanac office. The subjects will be letter-writing, penmanship, trigonometry, rudiments of analytical geometry and calculus, logarithms, theory and practice of computations, and astronomy. Each applicant must provide himself with a five-place logarithmic table. The examination will be held in Washington, and if applications are filed in season, arrangements may be made for examinations in the large cities. Blanks will be furnished upon application to the Commission at Washington.

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This Company also owns Letters-Patent No. 463,569, granted to Emile Berliner, November 17, 1891, for a combined Telegraph and Telephone, and controls Letters-Patent No. 474,231, granted to Thomas A. Edison, May 3, 1892, for a Speaking Telegraph, which cover fundamental inventions and embrace all forms of microphone transmitters and of carbon telephones.

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First inserted June 19, 1891. No response to date.

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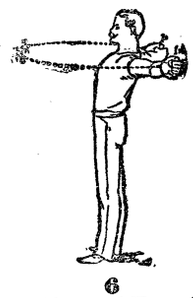

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